



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/648,183	08/25/2003	Byung-Seop Hong	51876P352	5151

8791 7590 02/24/2005

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

EXAMINER

DANG, TRUNG Q

ART UNIT	PAPER NUMBER
----------	--------------

2823

DATE MAILED: 02/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/648,183

Applicant(s)

HONG ET AL.

Examiner

Trung Dang

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 December 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 8, 14 and 15 is/are rejected.
- 7) ☒ Claim(s) 3-7, 9-13 and 16-23 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1, 2 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee (US Pat. 6,599,821) in view of Wu (US Patent 6,455,383) and Eichman et al. (US Pat. 5,308,655), all of record.

Lee teaches a method for fabricating a semiconductor device comprising the steps of: forming a stack layer of a gate layer (201), a poly-silicon layer (202), a tungsten layer (203), and a hard mask (204) sequentially deposited on a semiconductor substrate (200); selectively oxidizing only the poly-silicon layer (202) of the stack layer; heat treating the stack layer; and forming a gate sealing insulation layer (208) on the heat treated stack layer. See Fig. 2D and related text for the materials of layers 202 and 203. See col. 4, lines 13-25 for the selective oxidizing step and the annealing step (corresponds to the claimed heat treating step). Note that, since the selective oxidizing process and the annealing process of the reference are simultaneously performed, the

stress exerted during the selective oxidizing process would inherently released by the annealing process, absent evidence to the contrary.

Lee differs from the claim in not disclosing that insulating sidewall spacer 208 is of a nitride layer.

Wu teaches that gate sidewall spacers of silicon nitride are formed by LPCVD (col. 10, lines 3-4).

It would have been obvious to one of ordinary skill in the art to form the insulating sidewall spacer 208 in Lee by depositing a LPCVD silicon nitride layer as suggested by Wu because such LPCVD process to form nitride sidewall spacers is known in the art, and the application of a known process to made the same would have been within the level of one skilled in the art.

The combination of Lee and Wu including an annealing step (corresponds to the claimed heat treatment) and a nitride spacer deposition step by LPCVD (corresponds to the claimed forming a gate sealing nitride layer) is now differs from the claim in not disclosing a) the annealing step and the nitride deposition step are carried out by using LPCVD furnace under an in-situ method (claim 2), and b) the annealing step and the nitride deposition step are carried out in two different LPCVD furnaces under an ex-situ method (claim 8).

Eichman et al. teach a process in which a deposition step of a nitride layer and an annealing step can be carried out under an in-situ method (col. 2, line 63) or, alternatively, the deposition step and the annealing step can be carried out in two different LPCVD furnaces under an ex-situ method (col. 3, lines 46-49).

It would have been obvious to one of ordinary skill in the art to modify the teaching of the combination by carrying out the annealing step and the deposition step of the LPCVD nitride spacer 208 (resulted in the combined process of Lee and Wu) under an in-situ method or an ex-situ method because it is known that in situ processing is desirable for minimizing exposure of the wafer to particulates and oxygen outside the process chamber environment, and the ex-situ method is taught to produce the same result as in the in-situ method provided that the environment outside process chambers is controlled in a non-contaminated condition. Note that the process of the combination results in an annealing step being performed in a LPCVD furnace as recited in claim 1 because the annealing step and the step for depositing the LPCVD nitride spacer 208 are performed in-situ or ex-situ as mentioned above.

2. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu (US Pat. 6,455,383) in view of Eichman et al. (US. Pat. 5,308,655), all of record.

Wu teaches a method for fabricating a semiconductor device comprising the steps of: forming a stack layer of a gate oxide layer (301a), a poly-silicon layer (302a), a tungsten layer (306a), and a hard mask (307a) sequentially deposited on a semiconductor substrate (300); selectively oxidizing only the poly-silicon layer (302a) of the stack layer; depositing a gate sealing nitride layer (312a) by **LPCVD** on the selectively oxidized stack layer; and performing a rapid thermal annealing (RTA). See Fig. 4D(a) and related text for the materials of layers 301a, 302a, 306a, and 307a. See

col. 9, lines 27-29 for the claimed step of selectively oxidizing only the poly-silicon layer (302a) of the stack layer to form oxide layer 309a in Fig. 4E(a). See paragraph bridging column 9 and column 10 for the claimed steps of depositing a gate sealing nitride layer (312a) of Fig. 4F(a) by **LPCVD** on the selectively oxidized stack layer and heat treating the stack layer. Note that, the rapid thermal annealing (RTA) (corresponds to the claimed limitation "heat treating") to redistribute implanted doping impurities (col. 10, lines 1-2) would inherently release stress exerted during the selective oxidizing and gate sealing nitride layer depositing, absent evidence to the contrary.

Wu differs from the claim in not disclosing that the deposition of gate sealing nitride layer and the thermal annealing (corresponds to the claimed limitation "heat treating") are carried out in the identical furnace or in two different LPCVD furnaces under an ex-situ method as claimed in claim 15.

Eichman et al. teach a process in which a deposition step of a nitride layer and an annealing step following the deposition step can be carried out under an in-situ method (col. 2, line 63) or, alternatively, the deposition step and the annealing step can be carried out in two different LPCVD furnaces under an ex-situ method (col. 3, lines 46-49).

It would have been obvious to one of ordinary skill in the art to modify Wu's teaching by carry out the LPCVD of gate sealing nitride layer 312a and the following annealing step under an in-situ method (i.e., identical furnace) or an ex-situ method (i.e., two different LPCVD furnaces) as suggested by Eichman because it is known that in situ processing is desirable for minimizing exposure of the wafer to particulates and

oxygen outside the process chamber environment, and the ex-situ method is taught to produce the same result as in the in-situ method provided that the environment outside process chambers is controlled in a non-contaminated condition. Note that the combined process results in the thermal annealing step of Wu being performed in an LPCVD furnace as recited in claim 14.

Allowable Subject Matter

3. Claims 3-7, 9-13 and 16-23 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The reasons for the indication of allowable subject matter of the above claims were stated in the previous Office Action.

Response to Arguments

4. Applicant's arguments with respect to claims 14 and 15 have been considered but are moot in view of the new ground(s) of rejection.

With respect to the rejection of claims 1, 2, and 8, applicants primarily argue that Eichman does not teach or suggest LPCVD heat treatment and the gate sealing nitride layer formation processes which are carried out under in-situ or ex-situ (Remarks, page 9).

The Examiner disagrees. Apparently, applicants argue on the basis of piecemeal analysis of the references. However, it is axiomatic that one cannot show

nonobviousness by attacking references individually where the rejection, as here, is based on a combination of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). For example, applicants argue that Eichman does not teach or suggest the claimed feature as mentioned above. However, the combined process of Lee and Wu, not Eichman, is employed in the rejection to show the heat treatment step and the formation of the gate sealing nitride layer by LPCVD of the claimed process. Eichman's reference is relied in the rejection to provide logical reason as to why one skilled in the art would be motivated to make the proposed combination of references. Thus, the claims are met by the combined teaching of the references, not by single reference as alleged by applicants.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Trung Dang whose telephone number is 571-272-1857. The examiner can normally be reached on Mon-Friday 9:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Trung Dang
Primary Examiner
Art Unit 2823

2/21/05

